APPARATUS AND METHOD FOR COLD-PROOFING MULTIPLE DOUGH PIECES

BACKGROUND OF THE INVENTION

This invention relates to the field of dough proofing in general, and in particular to an apparatus and method for cold-proofing or hot-proofing multiple pieces of dough.

Proofing refers to the leavening or raising of dough. Dough prepared by mixing flour, water, yeast, carbohydrates, and other ingredients leavens or rises through yeast growth and metabolism of carbohydrates. Yeast metabolism of carbohydrates produces carbon dioxide, which causes the dough to expand, "proofing" the dough.

As noted in U.S. Pat. No. 4,674,402 issued to Raufeisen, proofing is a function of time, temperature, and humidity. U.S. Pat. No. 4,792,456 issued to Katz discloses that faster proofing is preferred because it retards microbial growth, improves shelf life of the finished product, and optimizes quality. Accordingly, U.S. Pat. No. 5,580,591 issued to Cooley states that proofing is optimal at elevated temperatures, around 95° F, which increase yeast activity.

Along with elevated temperatures, humidity aids proofing by preventing the dough from drying out. Controlling the level of humidity during proofing was addressed in the past with devices using steam generators or humidifiers, which added heated water vapor to the interior of the proofing device. Such devices are disclosed, for example, in Raufeisen, U.S. Pat. No. 4,635,540 issued to Dowds, and U.S. Pat. No. 5,072,666 issued to Hullstrung. In addition to steam generators, Raufeisen and U.S. Pat. No. 4,023,476 issued to Burgess disclose that such devices employed blowers or air heaters to circulate the heated water vapor inside the device.

As acknowledged in Raufeisen, the use of such steam generators or humidifiers caused problems with condensation and mineral deposits within the generators, which adversely

impacted steam generation and therefore the level of humidity. Hullstrung also noted problems with maintaining uniformity in the atmosphere within such proofing devices. And the use of dough proofed conventionally at elevated temperatures has been limited by a short shelf life after proofing, about two to three hours, often resulting in wasted dough. Problems with proofing conditions have also been known to affect the quality of dough, yielding dough of inconsistent or undesirable quality by drying out the dough surface or impeding yeast growth, which affects the aroma, flavor, and texture of the finished product.

Because of the need for elevated temperatures, moreover, proofing has been accomplished in devices separate from those for other steps in preparing dough for use in making the finished product. For example, Raufeisen discusses a process whereby the dough must be transferred between devices for thawing, proofing, and refrigerating, requiring intensive labor and effecting less than ideal conditions for dough development during exposure to ambient conditions.

In the past, dough proofing devices have been insulated, as noted in Raufeisen, and provided enclosed atmospheres of selected temperatures and humidity levels, as noted in Hullstrung. As explained in Hullstrung, proofing devices consequently tended to be elaborate – necessitating not only insulation, but as mentioned above, steam generators or humidifiers and blowers or air heaters – and their operation complicated.

Thus, there is a need for an apparatus or method for proofing dough that yields dough of consistent and desirable quality, preferably with an extended shelf life. A need exists also for an apparatus or method that simplifies dough proofing, for example, by eliminating the use of externally regulated humidity. Yet another need exists for an apparatus or method for cold-proofing multiple pieces of dough.

SUMMARY OF THE INVENTION

The present invention substantially overcomes the foregoing problems and achieves an advance in the art by providing an enclosure defining an enclosed volume in which multiple pieces of frozen dough can proof. To that end, the enclosure is adapted to carry multiple dough pieces. The enclosure is preferably thermally conductive and adapted to be received by a thermally controlled chamber. In another aspect of the invention the enclosure includes a door to provide access to enclosed volume.

In another aspect of the invention, a method comprises the step of thawing frozen dough at a temperature above 32° F. The method also includes proofing the thawed dough at a temperature above 32° F in a substantially enclosed environment. The method further includes holding the proofed dough at a temperature above 32° F in a substantially enclosed environment for up to 48 hours.

The following detailed description and drawings will aid in better understanding the objects, advantages, features, properties, and relationships of the present invention. The description and drawings set forth an illustrative aspect of the invention and demonstrate the various ways in which the principles of the invention may be employed.

DESCRIPTION OF THE DRAWINGS

In the drawings:

FIGURE 1 is a perspective view of an exemplary enclosure for proofing dough, in accordance with an aspect of the present invention, shown with the doors removed;

FIGURE 2 is an exploded perspective view of the enclosure of FIG. 1; and

FIGURE 3 is a flow diagram representing exemplary steps in cold-proofing multiple pieces of dough using the enclosure in accordance with an aspect of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

To create an environment in which multiple pieces of dough **16** can proof, an aspect of the present invention provides an enclosure **1** defining an enclosed volume **2**. Protrusions **3** are located on the inner surface of the enclosure **1** for supporting trays **14**, which may be slid into the enclosure **1** and supported by the protrusions **3** or any type of supporting device, such as shelves. In an aspect of the present invention, the trays **14** are made of metal or other conductive materials.

As shown in FIG. 1, the enclosure **1** may comprise half cavities or volumes created by an optional partition or middle shelf **4**. As will become apparent, adding a partition **4** provides certain advantages by allowing flexibility in the number of dough pieces **16** that can be accommodated by the apparatus.

More specifically, as shown in FIG. 2, the enclosure **1** may comprise a top **5** and a bottom **6** connected by two side panels **7, 8** and four doors **9, 10, 11, 12**, where two doors **9, 10** or **11, 12** stacked end to end extend the length of a side panel, **7** or **8**. The doors **9, 10, 11, 12** allow access to the front and rear of volumes defined by the enclosure **1** and may be operable in an open or closed position. While four doors are illustrated, any number of doors may be used.

To substantially prevent ventilation and enhance humidity retention, optional strips of elastic material or gaskets **13** may be attached to the edges of the side panels **7, 8** or doors **9, 10, 11, 12**. The enclosure **1** may also incorporate wheel-mounting plates **14** and wheels **15** for mobility. Any number of wheels or rollers may be attached to the bottom **6** to impart mobility to

the enclosure **1**. Further, no wheels are necessary to practice the invention. Optional handles **16** may also ease movement of the enclosure **1**.

Although FIGS. 1 and 2 illustrate the enclosure **1** as a rectangular structure, other shapes may be used that are capable of creating an enclosure **1**. In addition, the enclosure **1** may be adapted to carry multiple dough pieces **16,** which may be referred to as shells or discs, in a number of ways. The dough pieces **16**, may be placed on trays **14** that are supported by the protrusions **2** or any type of supporting device, such as shelves. In an aspect of the present invention, the trays **14** are made of metal, but other materials can be used without departing from the invention.

To allow the temperature of the enclosure **1** to readily adapt to that of the environment external to the enclosure **1**, whether refrigerated or heated, the enclosure **1** comprises a thermally conductive material, such as stainless steel or aluminum. However, the enclosure **1** may be comprised of numerous other conductive materials – including plastic and metal composites. To proof dough **16**, the enclosure **1** is placed into a thermally controlled chamber (not shown). The thermally controlled chamber provides temperatures utilized in the proofing method of the present invention that are above or below room temperature.

In a thermally controlled chamber, the doors **9, 10, 11, 12** of the enclosure **1** may be selectively fixed in an open position to allow the air of the chamber to flow through the enclosure **1**. The doors **9, 10, 11, 12** may also be set into a closed position to substantially seal the enclosure **1** and create an internal volume **3** with its own environment. The humidity within this environment may be regulated by adjusting the amount of dough or number of dough pieces placed into the enclosed volume **3**. This is a result of the moisture contained in the dough. As the dough thaws, frozen water molecules melt, which allows the water to evaporate from the

dough, thereby releasing water vapors. Inside the enclosure **1**, substantially sealed, the released water vapors generate and maintain a naturally humid environment.

In an aspect of the invention, as shown in FIG. 1, the partition **4** of the enclosure **1** separates the enclosure **1** into two sections **20**. Any number of sections **20** may be used by adding more partitions **4**, although the following description illustrates only two sections **20**. When the enclosure **1** is used at half capacity, the two separate sections **3** ensure proper humidity for cold-proofing by providing the volumes of the sections **3** appropriate for fewer dough pieces. In essence, the partition **4** allows for micro-environments for proofing dough, adding flexibility to enclosure **1**. Furthermore, the separate sections **3** preserve the quality of dough by limiting access – and the accompanying unwanted ventilation – to one cavity at a time as the dough is accessed for removal from the enclosure **1**. The enclosure **1** allows for consistent cold-proofing of multiple dough pieces **16**, by thawing, proofing, and holding the dough **16** in a substantially constant environment.

FIG. 3 is a flow diagram illustrating the method of the invention. The dough preferably comprises a water activity level of between approximately 0.929-0.999, as measured against the activity level of water itself, which is 1.000. This measurement refers to the amount of mobilized water molecules in the dough. A high level of water activity ensures that yeast remains active and viable at the temperatures preferably used in the cold-proofing method of the present invention. In one aspect of the invention, the dough formulation comprises a water activity level of between approximately 0.940-0.980.

Before beginning the method of the present invention, raw dough is prepared and divided into pieces, which may be optionally flattened and shaped into shells or discs, although any other shapes may be used to practice the invention. At step **315**, the dough is quick-frozen at a

temperature between approximately -40° and -60° F, and after freezing are held at approximately -10° F. At this temperature the yeast remains inactive. The dough may then be transported to restaurants for proofing. To thaw the frozen dough and initiate yeast activity at step **320**, one or more, trays of frozen dough pieces may be stacked into the enclosure **1**, for example, by placing the trays on the inner protrusions **2**. The enclosure **1** may then be placed into a thermally controlled chamber at a temperature above the freezing point of water, for example, between approximately 35°-50° F. Alternatively, thawing may occur at a temperature between approximately 38°-40° F. The doors **9, 10, 11, 12** of the enclosure **1** may be left open to allow air flow around the dough, which shortens the time required to thaw the dough, although the dough pieces will also thaw if the doors **9, 10, 11, 12** are in a closed position. The dough pieces may be thawed for about half a day.

At step **325**, once the dough pieces thaw, the dough releases moisture. To create a substantially enclosed volume **2** for proofing, the apparatus doors **9, 10, 11, 12** are closed, naturally humidifying the enclosed environment. As the dough pieces continue to release moisture, the enclosure **1** retains the moisture and thereby maintains a humid environment. In an aspect of the invention, the proofing step is maintained for about a day at a temperature between approximately 35°-50° F. Proofing may also occur at a temperature between approximately 38°-40° F.

At step **330**, the proofed dough pieces are ready to be used in making a finished product and can be held in the environment with the doors **9, 10, 11, 12** of the enclosure **1** closed. In particular, the dough can be maintained at a temperature between approximately 35°-50° F. In another aspect of the invention, the temperature range is maintained between approximately 36°-40° F. At the 36°-40°F temperature range, the dough pieces last for an extended shelf life of

about a day and a half to two days, thus minimizing waste. Specifically, dough held at a temperature of approximately 35° F may have a shelf life of up to two days. Generally, the shelf life decreases with increasing temperature. The cold-proofing method of the present invention also accommodates up to eight hours of access to the dough in the enclosure **1** without substantially compromising consistency of quality.

In a further aspect of this method for cold-proofing dough, the proofing may be accelerated in times of dough shortage or temperature error during any particular step. FIG. 3 illustrates how a step prior to the holding in cold-proofing at step **330** may be expedited. Either the thawing at step **320** or proofing at step **325** may be accelerated by applying heat to the dough. In an aspect of the present invention, the accelerated thawing at step **340** or accelerated proofing at step **345** may occur with the doors **9, 10, 11, 12** of the enclosure closed at a temperature of approximately 80° F for about 60-90 minutes, with the dough formulation dictating the optimal amount of time. Alternatively, the accelerated thawing at step **340** or the accelerated proofing at step **345** can occur at a temperature between approximately 75°-90° F for about 50-120 minutes. Still further, the accelerated thawing at step **340** or the accelerated proofing at step **345** can occur at a temperature between approximately 40°-100° F for 40-240 minutes.

To accelerate the thawing at step **340** or proofing at step **345**, a first enclosure **1** is initially placed – without any dough pieces and with the doors **9, 10, 11, 12** in an open position – into the thermally controlled chamber and preheated for about 30-60 minutes. In an aspect of the present invention, the enclosure **1** may also be preheated for about 40 minutes. Frozen or thawed dough pieces may then be loaded into the preheated enclosure **1** and allowed to thaw or proof, respectively, with the apparatus doors **9, 10, 11, 12** closed. Following accelerated thawing at step **340** or accelerated proofing at step **345**, the dough pieces may be loaded into a second

enclosure **1** that has been preset to a temperature specified for the next step. Cold-proofing may thereafter resume with the proofing step **325** or holding step **330**, as appropriate.

The invention is not confined to the aspects herein illustrated and described, and embraces such variations and modifications as may be within the ordinary skill of the artisan in this trade and as come within the scope of the following claims.